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PATENT ABSTRACTS OF JAPAN

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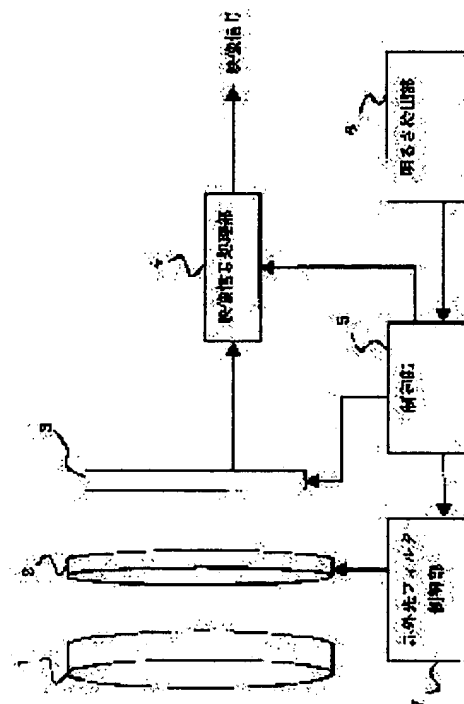
(72)Inventor : TOKUYAMA TAKASHI
 ISA TATSUO

(54) ON BOARD CAMERA SYSTEM

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain an on board camera system where the night vision is not lost in the case of photographing at a dark place and a video image close to coloring viewed by human eyes can be obtained in the case of photographing at a bright place.

SOLUTION: A lightness detection section 6 gives lightness data around a detected point to a control section 5, the control section 5 discriminates whether or not the lightness data received from the lightness detection section 6 are higher than a prescribed value. The control section 5 gives an infrared ray shut instruction to an infrared ray filter control section 7 when the lightness data are higher than the prescribed value and gives an infrared ray transmission instruction to the infrared ray filter control section 7 when the lightness data are smaller than the prescribed value. The infrared ray filter control section 7 selects infrared ray interruption/transmission of the infrared ray filter 2 according to the infrared ray shut/transmission instruction received from the control section 5 as its control so as to select shut/transmission of the infrared ray included in an object light made incident onto a light receiving face of an image pickup element 3.



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CLAIMS

[Claim(s)]

[Claim 1] The photographic subject light which carries out incidence to an image sensor through a taking lens is changed into an electrical signal. In the mounted camera equipment which projects the image of the car circumference on the display screen which acquired the necessary video signal and was installed in the car by carrying out signal processing suitably in a video-signal processing circuit Mounted camera equipment characterized by changing the amount of transparency of the infrared light contained in the photographic subject light which has the infrared light filter which carries out adjustable [of the amount of transparency of infrared light], and the control means which controls the amount of infrared light transparency of this infrared light filter ahead [of said image sensor], and carries out incidence to said image sensor with directions of said control means.

[Claim 2] It has a brightness detection means to detect the brightness at the time of photography, and the control means which controls the amount of infrared light transparency of said infrared light filter based on the detection result of this brightness detection means. Mounted camera equipment according to claim 1 characterized by making the amount of transparency of infrared light small for the amount of infrared light transparency of said infrared light filter by said control means based on the detection result of said brightness detection means in being bright, and enlarging the amount of transparency of infrared light in being dark.

[Claim 3] The mounted camera equipment according to claim 1 to which it has a car light detection means detect burning and putting out lights of a car light, and the control means which switch infrared-light transparency and cutoff of said infrared-light filter based on the detection result of this car light detection means, and said car light is characterized by said control means at the time of burning by for a switch and said car light to switch said infrared-light filter to infrared-light transparency, to switch said infrared-light filter to infrared-light cutoff at the time of putting out lights, and to picturize.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to mounted camera equipment, and relates to the mounted camera equipment which projects the image of the car circumference on the display screen especially installed in the car.

[0002]

[Description of the Prior Art] CCD is almost used for the image sensor of the video camera equipment for inputting an image now. CCD of a high resolution application also has millions of photodiodes, and one unit called this pixel is arranged by accuracy two-dimensional in the precision of a micron unit. Therefore, since there is no graphic form distortion, the image of a CCD camera fits the image processing.

[0003] Image formation of the image of a photographic subject is carried out to the light-receiving side of CCD through a taking lens, and it is spatially sampled by the photodiode. According to the scan of television, reading appearance of the optical image by which image formation was carried out to the CCD image sensor is carried out as an electrical signal. By CCD for a vertical transfer, it transmits at a time perpendicularly one train of signal charges accumulated in the photodiode, and they are sent to CCD for a level transfer. By CCD for a level transfer, the signal for one train sent from CCD for a vertical transfer is sent to output amplifier for every scanning line, and reading appearance is carried out as an electrical potential difference.

[0004] Such a CCD camera is carried in a car and the attempt about white line recognition of a transit route and insurance transit of obstruction detection etc. is made. Moreover, it projects on the display screen which installed the image picturized with this camera equipment in the car, and it is intelligible for an operator and the situation of the car circumference is made.

[0005] And although it originally has not only a visible-ray field but the sensibility to an infrared light field in CCD itself which is an image sensor Since the hue of the image to project turns into a hue as which red was emphasized from the hue seen by people's eyes when CCD which has sensibility to an infrared light field is used, conventionally An infrared light filter is installed before CCD, and he is made not to carry out incidence of the light of an infrared light field to an image sensor, and is trying to acquire the image of the hue near the hue seen by people's eyes.

[0006]

[Problem(s) to be Solved by the Invention] By the way, as mentioned above, when such a conventional video camera performs an image pick-up in a dark location, in order not to carry out incidence of the light of an infrared light field to an image sensor, there is a problem of spoiling night vision nature. When it was made to carry out incidence of the photographic subject light which is made to give priority to the night vision engine performance, and contains the light of an infrared region to an image sensor, there was a problem that an image was picturized by the hue as which red was emphasized from the hue seen by people's eyes in the case of an image pick-up in a bright location.

[0007] As mentioned above, the object of this invention is offering the mounted camera equipment which switches transparency and cutoff of the light of the infrared light field included in the photographic subject light which carries out incidence to an image sensor, picturizes by the hue near the hue seen by people's eyes in the time of photography in a bright location, and raises and picturizes night vision nature in photography in a dark location.

[0008] Moreover, the object of this invention is offering the picturized mounted camera equipment which intercepts the infrared light contained in photographic subject light in photography in a bright location, carries out incidence to an image sensor, penetrates the infrared light contained in photographic subject light in photography in a dark location, and carries out incidence to an image sensor automatically according to the brightness at the time of photography.

[0009] Furthermore, burning and putting out lights of a car light are interlocked with, a car light penetrates the infrared light contained in photographic subject light at the time of burning, and the object of this invention is that a car light

offers the mounted camera equipment which intercepts and picturizes the infrared light contained in photographic subject light at the time of putting out lights.

[0010]

[Means for Solving the Problem] According to this invention, the above-mentioned technical problem changes into an electrical signal the photographic subject light which carries out incidence to an image sensor through a taking lens. In the mounted camera equipment which projects the image of the car circumference on the display screen which acquired the necessary video signal and was installed in the car by carrying out signal processing suitably in a video-signal processing circuit The infrared light filter which carries out adjustable [of the amount of transparency of infrared light] ahead [of said image sensor], It has the control means which controls the amount of infrared light transparency of this infrared light filter, and is attained by the mounted camera equipment which changes the amount of transparency of the infrared light contained in the photographic subject light which carries out incidence to said image sensor with directions of said control means.

[0011] That is, if constituted as mentioned above, transparency and cutoff of the light of the infrared light field included in photographic subject light can be switched, and incidence can be carried out to an image sensor.

[0012] Moreover, a brightness detection means to detect the brightness at the time of photography according to this invention in the above-mentioned technical problem, It has the control means which controls the amount of infrared light transparency of said infrared light filter based on the detection result of this brightness detection means. Based on the detection result of said brightness detection means, by said control means, in being bright, it makes the amount of transparency of infrared light small for the amount of infrared light transparency of said infrared light filter, and it is attained by the mounted camera equipment which enlarges the amount of transparency of infrared light when dark.

[0013] That is, if constituted as mentioned above, the amount of the light of the infrared light field included in the photographic subject light which carries out incidence to an image sensor can be automatically adjusted according to the brightness at the time of photography, in being bright, it intercepts the infrared light which carries out incidence to an image sensor, and when dark, the infrared light which carries out incidence to an image sensor can be penetrated.

[0014] Furthermore, a car light detection means to detect burning and putting out lights of a car light according to this invention in the above-mentioned technical problem, It has the control means which switches infrared light transparency and cutoff of said infrared light filter based on the detection result of this car light detection means. Said car light is attained by said control means with the mounted camera equipment which a switch and said car light switch said infrared light filter to infrared light transparency, switch said infrared light filter to infrared light cutoff at the time of putting out lights, and is picturized at the time of burning.

[0015] That is, if constituted as mentioned above, according to burning and putting out lights of a car light, cutoff and transparency of the infrared light contained in the photographic subject light which carries out incidence to an image sensor can be switched and picturized, the infrared light in which a car light carries out incidence to an image sensor at the time of burning is intercepted, and a car light can penetrate the infrared light which carries out incidence to an image sensor at the time of putting out lights.

[0016]

[Embodiment of the Invention] (A) The important section block diagram 1 of the 1st example of the 1st example (A-1) is an important section block diagram of the 1st example of this invention. In drawing 1, the control section by which in 1 an image sensor (CCD) and 4 control the video-signal processing section, and, as for 5, a taking lens, the infrared light filter which 2 can switch [of transparency and cutoff of infrared light], and 3 control the whole camera, the brightness detecting element to which 6 detects the brightness at the time of photography, and 7 are infrared light filter control sections which switch transparency and cutoff of the infrared light of the infrared light filter 2.

[0017] A taking lens 1 is an object which condenses photographic subject light and carries out image formation to the light-receiving side of an image sensor 3 through the infrared light filter 2. As for the infrared light filter 2, transparency and cutoff of infrared light are controlled by the below-mentioned infrared light filter control section.

[0018] An image sensor 3 is CCD for colors, and is equipped with the level charge transfer way formed in the light-receiving side at a part for the trailer of the light-receiving diode group (pixel group) by which the matrix array was carried out, vertical charge transfer **** by which contiguity formation was carried out through the transfer gate at this pixel group, and vertical charge transfer ****. and -- while carry out a charge transfer to vertical charge transfer **** through exposure period termination, simultaneously the charge transfer gate and making all the pixel charges accumulated in a pixel group at an exposure period shorter than a field period transmit to a single-tier [every] level charge transfer way further synchronizing with the scan read-out control signal impressed to the transfer electrode group prepared in vertical charge transfer **** -- a dot order -- it has the structure which reads each pixel charge next.

[0019] The video-signal processing section 4 outputs the video signal of NTSC system to it, after performing

predetermined signal processing to each pixel charge read from the image sensor 3 including the white balance circuit, the gamma correction circuit, the matrix circuit, the encoder circuit, etc.

[0020] A control section 5 controls the whole video camera, and controls infrared light transparency and cutoff of the infrared light filter 2 to the infrared light filter control section 7 based on the detection result of the below-mentioned brightness detecting element 6.

[0021] The brightness detecting element 6 inputs into a control section 5 the brightness data which detect the brightness of the circumferences, such as an illuminometer, and were detected. That is, the brightness detecting element 6 detects the surrounding brightness at the time of an image pick-up, and inputs the detected brightness data into a control section 5.

[0022] According to transparency / cutoff directions of the infrared light from a control section 5, by driving a motor (not shown), the infrared light filter control section 7 carries out the roll control of the below-mentioned infrared light drawing wing, and switches transparency and cutoff of the infrared light of the infrared light filter 2.

[0023] At the time of photography with a video camera, the brightness detecting element 6 detects surrounding brightness, and inputs brightness data into a control section 5, and a control section 5 inputs infrared light cutoff directions of the infrared light filter 2 into the infrared light filter control section 7, when the brightness data inputted from the brightness detecting element 6 are more expensive than a predetermined value. On the other hand, when brightness data are lower than a predetermined value, infrared light transparency directions of the infrared light filter 2 are inputted into the infrared light filter control section 7.

[0024] The infrared light filter control section 7 sets up transparency or cutoff of the infrared light of the infrared light filter 2 according to infrared light transparency / cutoff directions inputted from a control section 5.

[0025] And the video-signal processing section 4 performs predetermined signal processing to each pixel charge read from the image sensor 3, and outputs a video signal to it.

[0026] As mentioned above, according to the brightness at the time of photography, when brighter than a predetermined value, setting out of an infrared light filter can be set as infrared light cutoff, when darker than a predetermined value, setting out of an infrared light filter can be set as infrared light transparency, and the amount of infrared light contained in the photographic subject light which carries out incidence to an image sensor can be adjusted.

[0027] (A-2) The block diagram 2 of an infrared light filter is an explanatory view of the infrared light filter 2. As shown in this drawing, the infrared light filter 2 is equipped with the infrared light drawing wings R1-R8 of plurality (for example, eight sheets). Each infrared light drawing wing is the thing of the construction material which intercepts the light of an infrared region and penetrates the light of a light field.

[0028] The infrared light drawing wings R1-R8 have structure which can carry out adjustable [of the area of Opening OS] by being made of the filter raw material which intercepts the light of an infrared light field, respectively, and rotating an infrared light drawing wing by the motor which is not illustrated. In photography in a bright location, by making area of Opening OS small, the amount of transparency of the infrared light contained in photographic subject light is made small, and the amount of transparency of the infrared light contained in photographic subject light by enlarging area of Opening OS in photography in a dark location is enlarged.

[0029] Drawing 3 (a) is an example in the case of intercepting the infrared light contained in photographic subject light, and is an example at the time of controlling the infrared light drawing wings R1-R8, and making area of Opening OS into min. Drawing 3 (b) is an example in the case of penetrating the infrared light contained in photographic subject light, and is an example at the time of controlling the infrared light drawing wings R1-R8, and making area of Opening OS into max. Thus, the infrared light filter 2 adjusts the amount of infrared light contained in the photographic subject light which carries out incidence to the light-receiving side of an image sensor 3.

[0030] (A-3) Flow drawing 4 of the 1st example of operation is drawing showing the flow of the 1st example of operation. First, the brightness detecting element 6 detects surrounding brightness, and inputs brightness data into a control section 5 (step S101), a control section 5 compares the brightness data inputted from the brightness detecting element 6 with the predetermined value memorized in built-in memory (not shown), and it judges whether surrounding brightness is brighter than a predetermined value (step S102).

[0031] At step S102, when surrounding brightness is beyond a predetermined value, a control section 5 directs cutoff of the light of an infrared region to the infrared light filter control section 7, and it sets up the infrared light filter control section 7 so that the infrared light drawing wings R1-R8 of the infrared light filter 2 may be rotated by driving a motor (not shown), Opening OS may be changed into a close-by-pass-bulb-completely condition and infrared light may be intercepted (step S103).

[0032] On the other hand, at step S102, when surrounding brightness is smaller than a predetermined value, a control section 5 directs transparency of the light of an infrared region to the infrared light filter 7, and it sets up the infrared

light filter control section 7 so that the infrared light drawing wings R1-R8 of the infrared light filter 2 may be rotated by driving a motor (not shown), Opening OS may be changed into a full admission condition and infrared light may be penetrated (step S104).

[0033] And at step S103 or step S104, after ending infrared light transparency / cutoff setting out of the infrared light filter 2, the video-signal processing section 4 reads the pixel charge accumulated in the image sensor 3, performs predetermined signal processing, and outputs a video signal (step S105).

[0034] If it is made above, surrounding brightness is detected in the case of photography, when surrounding brightness is brighter than a predetermined value, the infrared light contained in photographic subject light is intercepted, and when surrounding brightness is darker than a predetermined value, the photographic subject light containing infrared light can be penetrated and picturized.

[0035] In addition, although setting out of the infrared light filter 2 was switched in two steps of infrared light cutoff and transparency based on whether the brightness at the time of photography is beyond a predetermined value, you may make it set up finely the area of the opening OS of the infrared light drawing R1-R8 in explanation of the 1st example of the above according to the brightness at the time of photography. The amount of transparency of the infrared light contained in photographic subject light in such a case according to the brightness at the time of photography can be adjusted finely.

[0036] (B) the -- two -- an example (B-1) -- the -- two -- an example -- an important section -- a block diagram -- five -- this invention -- the -- three -- an example -- an important section -- a block diagram -- it is -- one -- a taking lens -- two -- infrared light -- a filter -- three -- an image sensor (CCD) -- four -- a video signal -- processing -- the section -- five -- ' -- a video camera -- the whole -- controlling -- a control section -- six -- ' -- photography -- the time -- incident light -- an amount -- detecting -- incident light -- an amount -- a detecting element -- seven -- an infrared light filter control section -- it is .

[0037] A taking lens 1, the infrared light filter 2, an image sensor 3, the video-signal processing section 4, and the infrared light filter control section 7 are the same as that of the thing of explanation at drawing 1 .

[0038] Control-section 5' controls the whole video camera, and directs switch control of infrared light transparency and cutoff of the infrared light filter 2 to the infrared light filter control section 7 based on the detection result of below-mentioned amount detecting-element of incident light 6'.

[0039] Based on the pixel charge accumulated by the light which received light in respect of light-receiving of an image sensor 3, from the amount of charges accumulated in each pixel of an image sensor 3, amount detecting-element of incident light 6' detects the quantity of light which carries out incidence to an image sensor 3, and inputs the detected amount data of incident light into control-section 5'.

[0040] The infrared light filter control section 7 carries out the roll control of the infrared light drawing wings R1-R8 of the infrared light filter 2 by driving a motor (not shown) according to infrared light cutoff / transparency directions inputted from control-section 5', and switches cutoff and transparency of infrared light.

[0041] (B-2) Flow drawing 6 of the 2nd example of operation is drawing showing the flow of the 2nd example of this invention of operation. First, the amount data of incident light into which amount detecting-element of incident light 6' detected the quantity of light which carries out incidence to an image sensor 3 through a taking lens 1, and inputted the amount data of incident light into control-section 5' (step S201), and control-section 5' was inputted, The predetermined value memorized in built-in memory (not shown) is compared, and it judges whether the quantity of light which carries out incidence to an image sensor 3 is larger than a predetermined value (step S202).

[0042] At step S202, when the amount of incident light is larger than a predetermined value, control-section 5' performs infrared light cutoff directions to the infrared light filter control section 7, and the infrared light filter control section 7 is set up so that the infrared light drawing wings R1-R8 of the infrared light filter 2 may be rotated in the direction closed by driving a motor (not shown), the area of Opening OS may be changed into a close-by-pass-bulb-completely condition and infrared light may be intercepted (step S203).

[0043] On the other hand, at step S202, when the amount of incident light is smaller than a predetermined value, control-section 5' performs infrared light transparency directions to the infrared light filter control section 7, and the infrared light filter control section 7 is set up so that the infrared light drawing wings R1-R8 of the infrared light filter 2 may be rotated in the direction opened by driving a motor (not shown), the area of Opening OS may be changed into a full admission condition and infrared light may be penetrated (step S204).

[0044] And at step S203 or step S204, after ending infrared light transparency / cutoff setting out of the infrared light filter 2, the video-signal processing section 4 reads the pixel charge accumulated in the image sensor 3, performs predetermined signal processing, and outputs a video signal (step S205).

[0045] If it is made above, according to the amount of the light which carries out incidence to an image sensor through a

taking lens, the amount of the light of the infrared light field included in photographic subject light can be adjusted, and while being able to picturize by the hue near the hue seen by people's eyes, at the time of photography in a bright location, it can picturize at the time of photography in a dark location, without spoiling night vision nature.

[0046] (C) The important section block diagram 7 of the 3rd example of the 3rd example (C-1) is an important section block diagram of the 3rd example of this invention. The 3rd example is an example at the time of applying this invention to the equipment which photos the image of the car circumference with the camera carried in the car.

[0047] In drawing 7, as for an image sensor and 4, an infrared light filter and 3 are [the video-signal processing section and 7] infrared light filter control sections, and a taking lens and 2 of 1 are the same as that of the thing of explanation at drawing 1.

[0048] The control section by which 5" controls the mounted whole camera, and 8 are light burning detecting elements which detect turning on and off of the light switch of a car.

[0049] It connects with the light switch of a car, and the light burning detecting element 8 detects [to which the light of a car is on / or or] whether putting out lights is carried out, and outputs burning / putting-out-lights information on a car light to control-section 5."

[0050] Control-section 5" directs infrared light transparency and cutoff of the infrared light filter 2 to the infrared light filter control section 7 based on the burning information on the car light from the light burning detecting element 8.

[0051] The infrared light filter control section 7 carries out the roll control of the infrared light drawing wings R1-R8 of the infrared light filter 2 by driving a motor (not shown) according to the directions from control-section 5", and carries out setting-out control of transparency and the cutoff of infrared light.

[0052] (C-2) Flow drawing 8 of the 3rd example of operation is drawing showing the flow of the 3rd example of this invention of operation. First, control-section 5" judges [to which the car light is on / or or] whether putting out lights is carried out based on the car light information that it is inputted from the light switch detecting element 8 (step S301).

[0053] At step S301, if a car light is lit, to the infrared light filter control section 7, control-section 5" will rotate, when delivery and the infrared light filter control section 7 drive [infrared light transparency directions] a motor (not shown) for the infrared light drawing R1-R8 of the infrared light filter 2, and will set the area of Opening OS as a full admission condition to it (step S303).

[0054] On the other hand, at step S301, if the car light has gone out, to the infrared light filter control section 7, control-section 5" will rotate, when delivery and the infrared light filter control section 7 drive [infrared light cutoff directions] a motor (not shown) for the infrared light drawing R1-R8 of the infrared light filter 2, and will set the area of Opening OS as a close-by-pass-bulb-completely condition to it (step S304).

[0055] At step S303 or step S304, after infrared light cutoff setting out of the infrared light filter 2 is completed, the video-signal processing section 4 reads the pixel charge accumulated in the image sensor 3, performs predetermined processing, and outputs a video signal (step S305).

[0056] If it is made above, at the time of burning of a car light, incidence of the photographic subject light containing the light of an infrared light field is carried out to an image sensor (when dark in the car circumference), and at the time of putting out lights of a car light, incidence of the photographic subject light except the light of an infrared light field can be carried out to an image sensor (when bright in the car circumference). That is, burning and putting out lights of a car light can be interlocked with, and transparency and cutoff of the infrared light contained in the photographic subject light which carries out incidence to the image sensor of a camera can be switched.

[0057] As mentioned above, although the example explained this invention, according to the main point of this invention indicated to the claim, various deformation is possible for this invention, and this invention does not eliminate these.

[0058]

[Effect of the Invention] As mentioned above, according to this invention, infrared light transparency / cutoff setting out of an infrared light filter is performed, and since the amount of infrared light contained in the photographic subject light which carries out incidence to an image sensor was switched, the amount of incident light of infrared light can be switched by liking of a user. That is, by photography in a bright location, the image of the hue near the hue which intercepted the infrared light contained in photographic subject light, and was seen by people's eyes can be acquired, on the other hand, by photography in a dark location, incidence of the photographic subject light which contained infrared light in the image sensor can be carried out, and night vision nature can be raised.

[0059] Moreover, according to this invention, according to the brightness at the time of photography, incidence of the photographic subject light except the light of an infrared light field is carried out to an image sensor in the case of photography in a bright location. Since it was made to carry out incidence of the photographic subject light which contains the light of an infrared light field in the case of photography in a dark location to an image sensor, while being

able to picturize an image by the hue near the hue seen by people's eyes at the time of photography when bright in a perimeter, the night vision nature in the case of being dark in a perimeter can be raised at the time of photography.

[0060] Furthermore, according to this invention, since burning and putting out lights of a car light are interlocked with and infrared light cutoff / transparency setting out of an infrared light filter was switched, at the time of car light burning, incidence of the photographic subject light which contains infrared light in an image sensor can be carried out, incidence of the photographic subject light except infrared light can be carried out to an image sensor at the time of car light putting out lights, and it is convenient.

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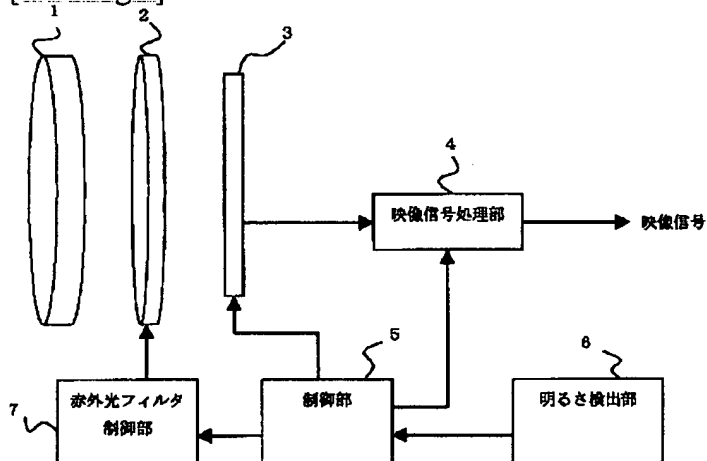
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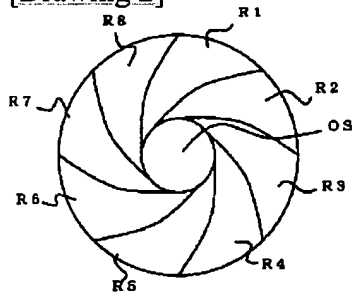
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DRAWINGS

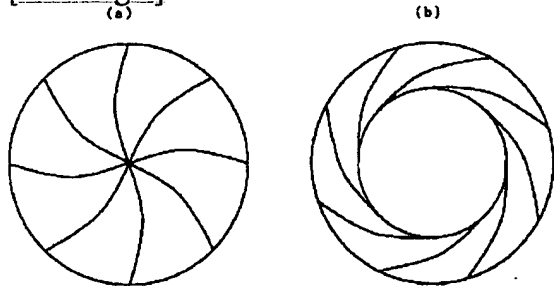
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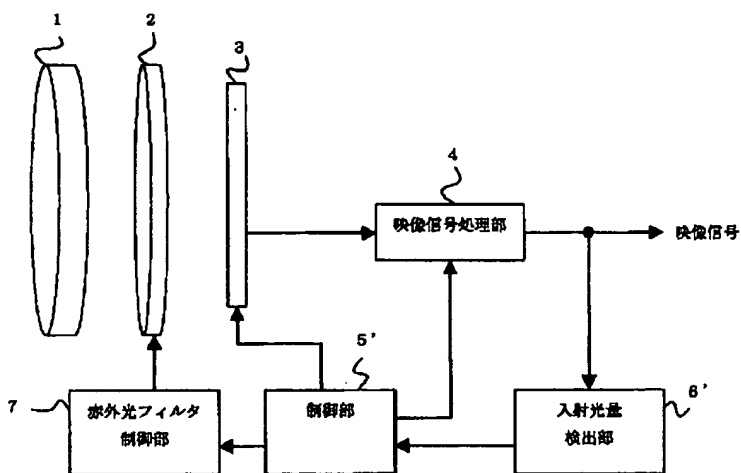
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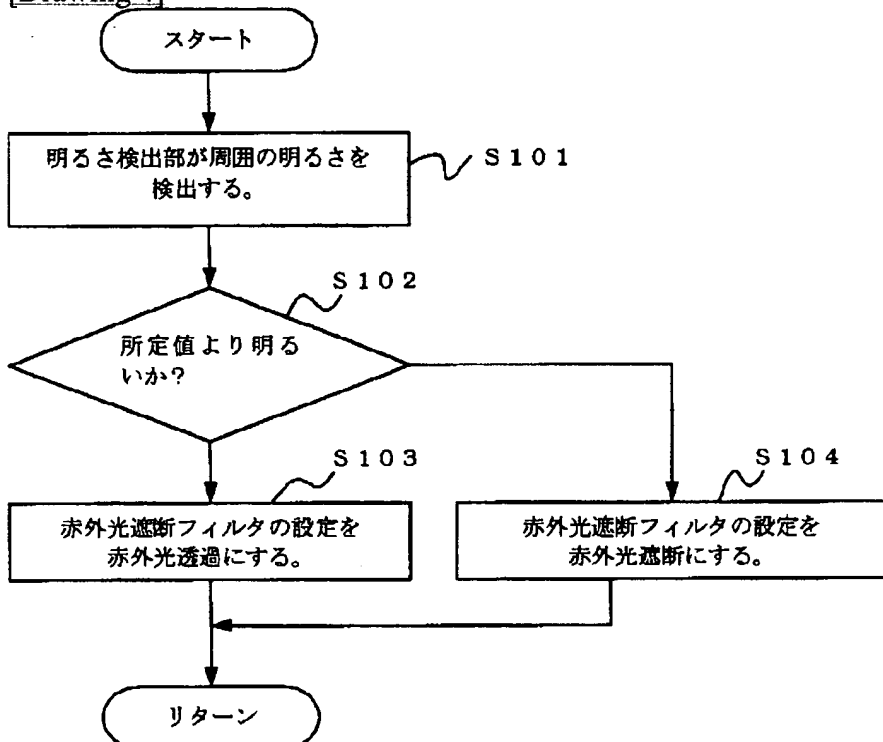
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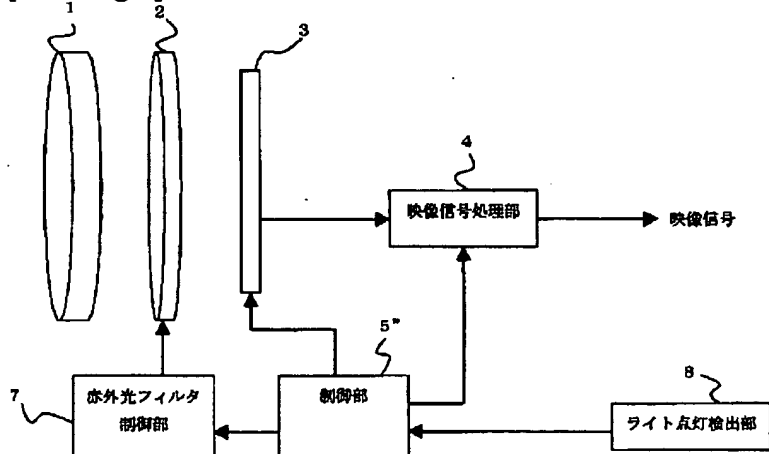
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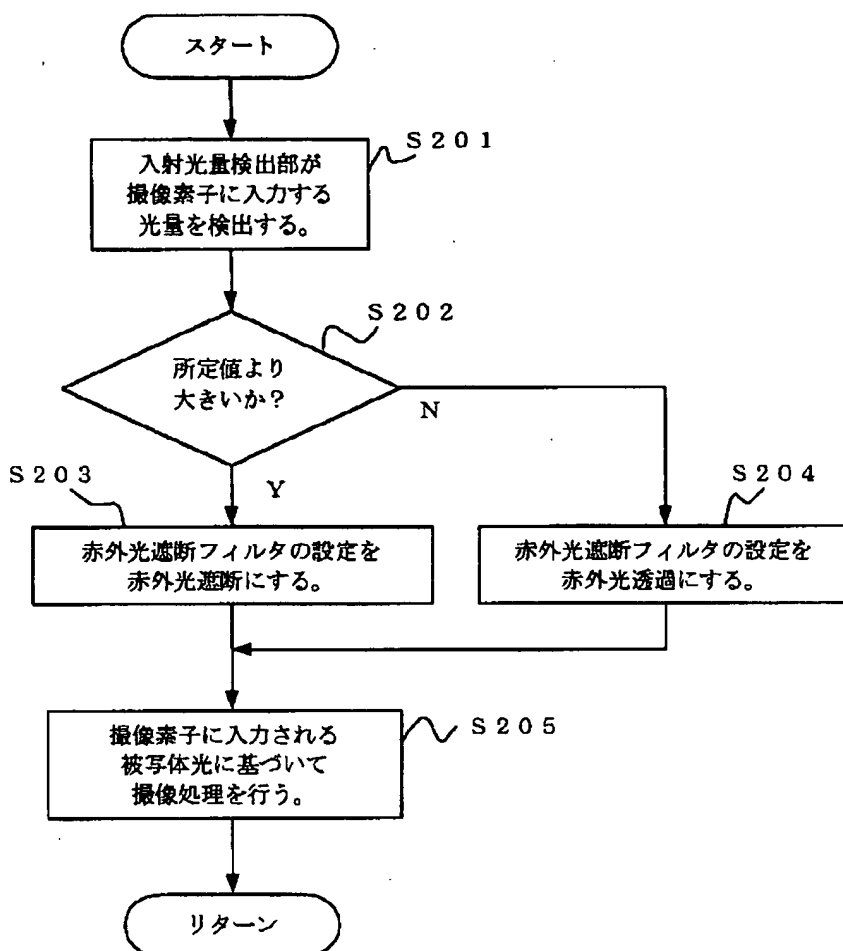
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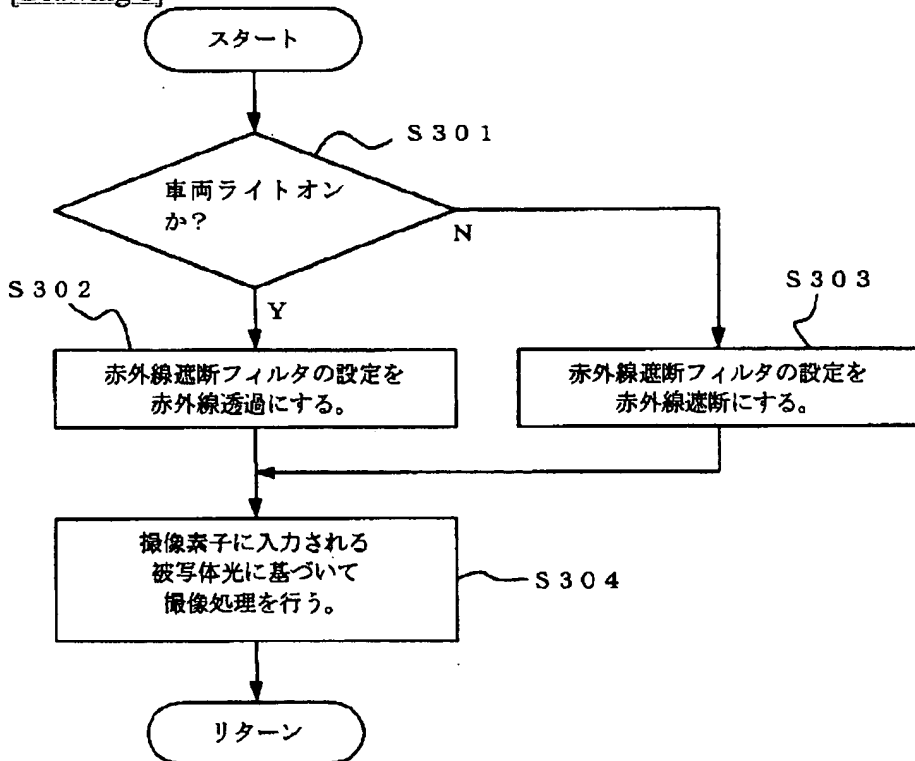
[Drawing 7]



[Drawing 6]



[Drawing 8]



[Translation done.]